OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **STONE POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stabilizing* in-lake chlorophyll-a trend. Spring rain most likely caused the increase in chlorophyll concentrations seen in June by increasing the epilimnetic phosphorus concentrations. July results were low for Stone Pond, and mean chlorophyll concentrations have remained below the average value for NH lakes for over 10 years! While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *slightly improving* trend in lake transparency. Water clarity was slightly decreased in June (compared to last year) possibly due to the increased algal abundance. Transparency values continue to be above the NH mean reference line, and we hope this trend continues for Stone Pond. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters.

Too much phosphorus in a lake can mean excess plants and algal blooms, neither of which is appealing to most lake residents. These graphs show a *variable* trend in the upper water layer, and a *slightly worsening* trend in the lower water layer. Hypolimnetic phosphorus concentrations were elevated in July. The sample was slightly turbid and bottom sediment in the sample could have raised the phosphorus concentration. Also, dissolved oxygen was depleted at this depth, and this can cause phosphorus bound to the sediment to be released into the water column, which can raise phosphorus concentrations. Phosphorus concentrations were slightly higher in the epilimnion in June, most likely as a result of spring rains and snowmelt washing excess nutrients into the pond. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- **Please note** in June, phosphorus levels were found to be less than 5 µg/L in the epilimnion and the Inlet. The NHDES Laboratory Services adopted a new method of analyzing total phosphorus this year and the lowest value that can be recorded is 'less than 5 µg/L'. If this caused an increase in the average phosphorus for either of the station we would like to remind the association that a reading of 5 µg/L is considered low for New Hampshire's waters.

- Conductivity decreased back to normal levels from the slightly elevated readings of the 1999 season (Table 6). The return of rainfall enabled the pond to be flushed out, which decreased the accumulation of salts in the pond. This decrease is a positive sign for Stone Pond. Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can each influence conductivity readings.

- Dissolved oxygen continues to be depleted in the last two meters of the pond, but remains high throughout the rest of the water column. There was a spike in oxygen saturation (above 100%) 7 meters below the surface of the pond (Table 9). A layer of algae suspended at that depth most likely caused this saturation. Algae release oxygen as a product of photosynthesis, which often causes the spike in oxygen saturation observed in the pond.

NOTES

- Monitor's Note (6/27/00): Frequent rains all spring.

USEFUL RESOURCES

Comprehensive Shoreland Protection Act, RSA 483-B, WD-BB-35, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

What Can You Do to Prevent Shoreland Erosion?, WD-BB-30, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

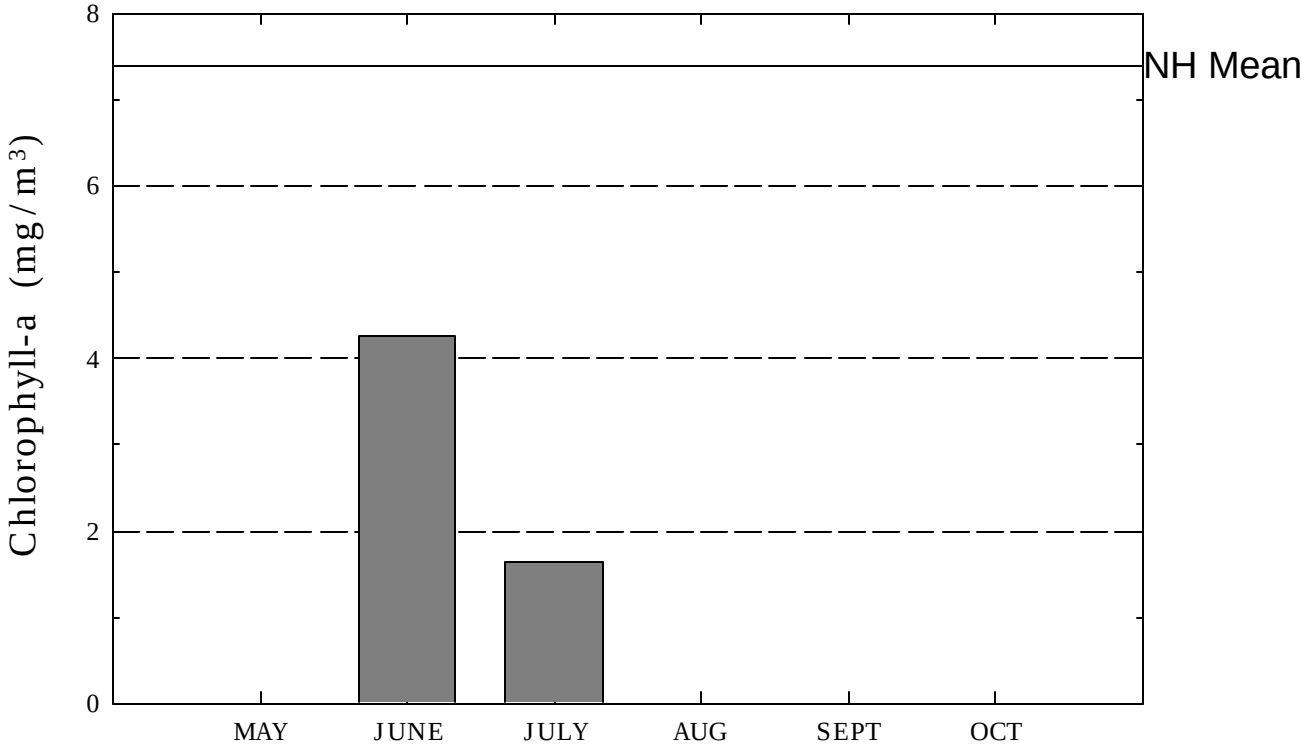
The Lake Pocket Book, The Terrene Institute, 2000. (800) 726-5253, or www.terrene.org

Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

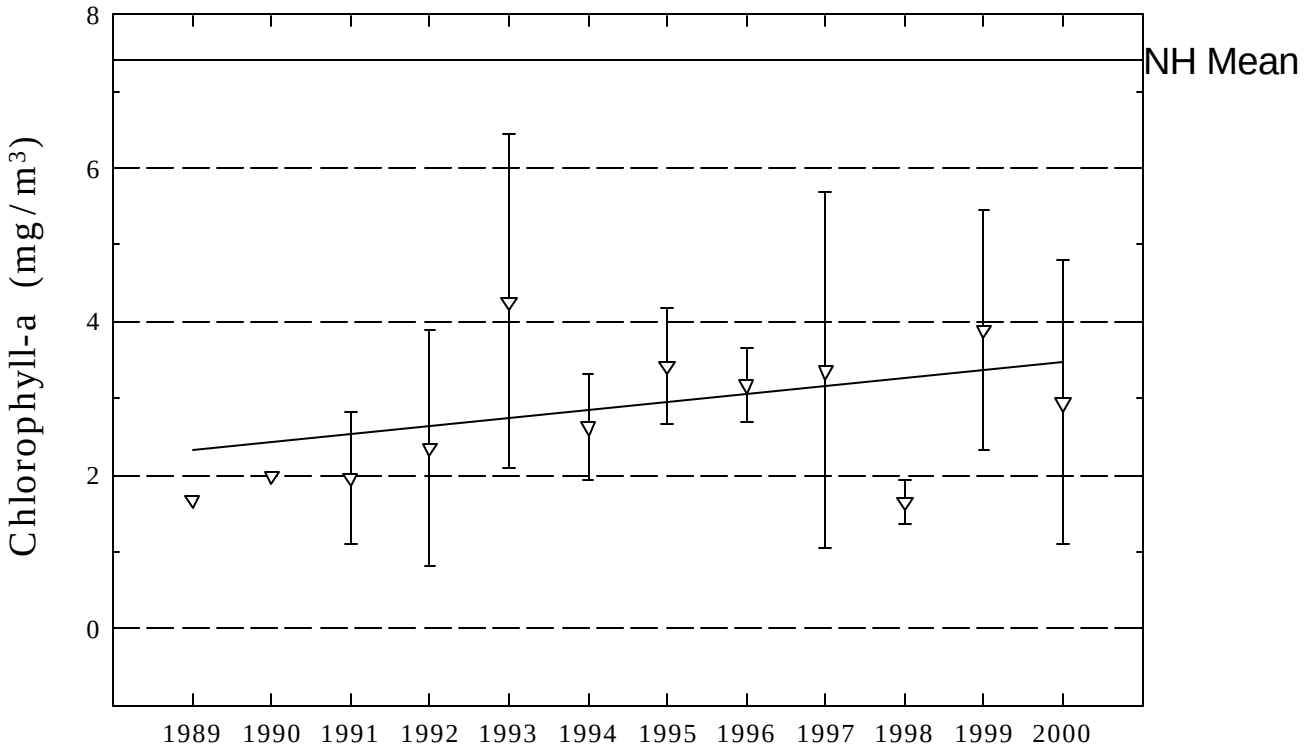
Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Stone Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



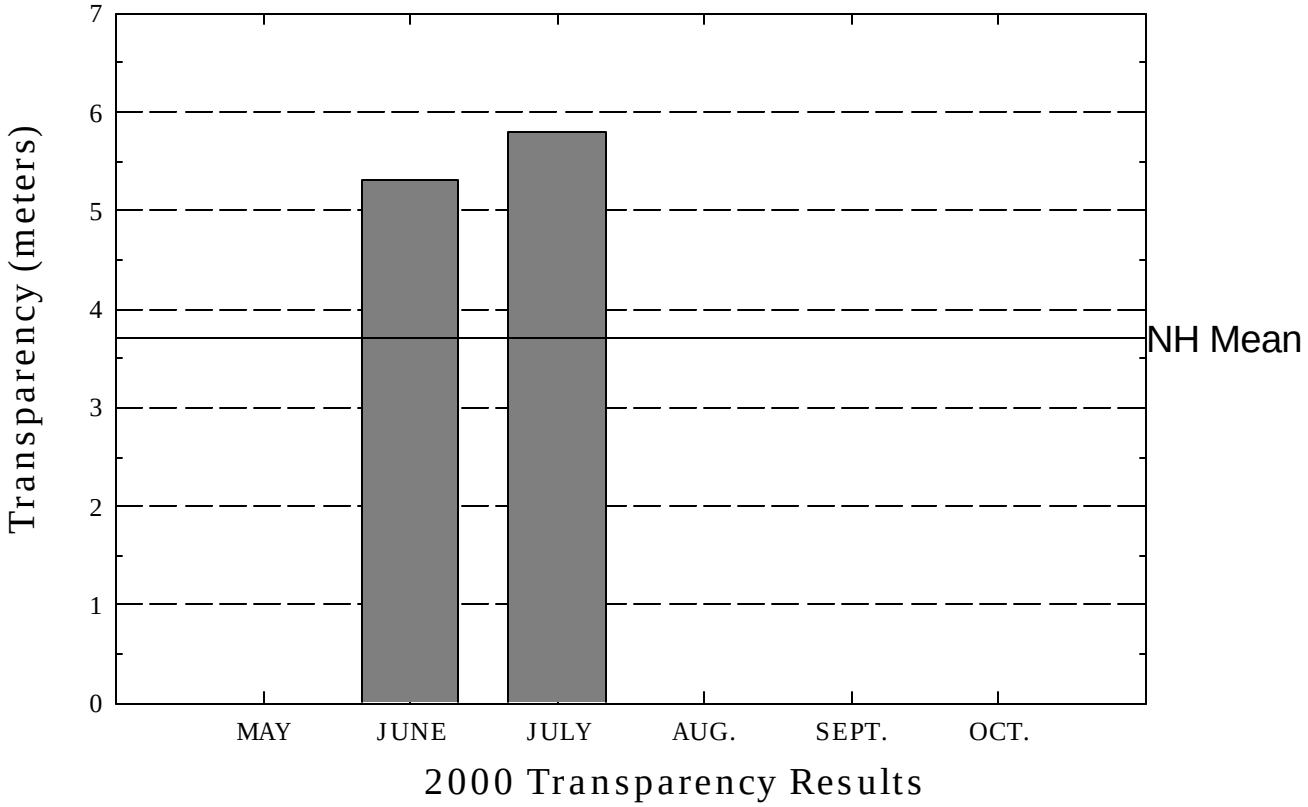
2000 Chlorophyll-a Results

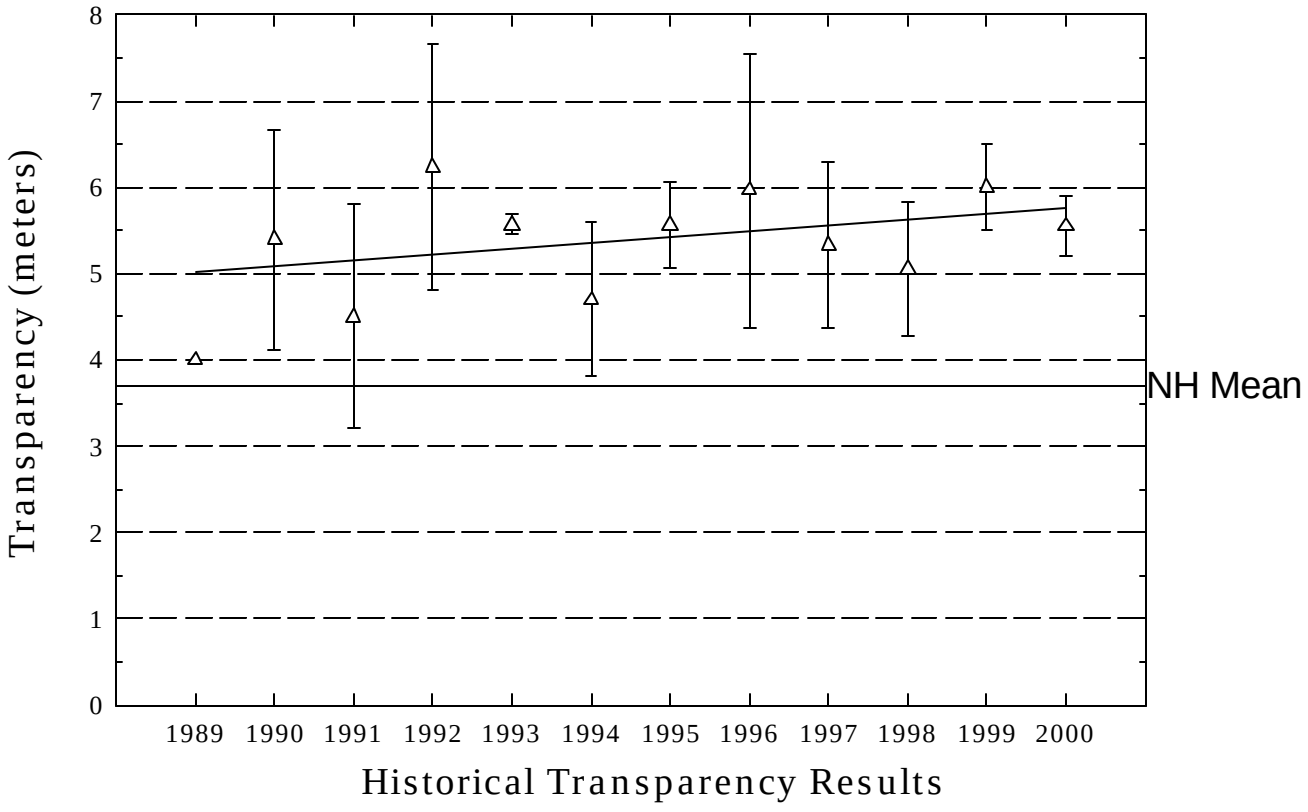


Historical Chlorophyll-a Results

Stone Pond

Figure 2. Monthly and Historical Transparency Results





Stone Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

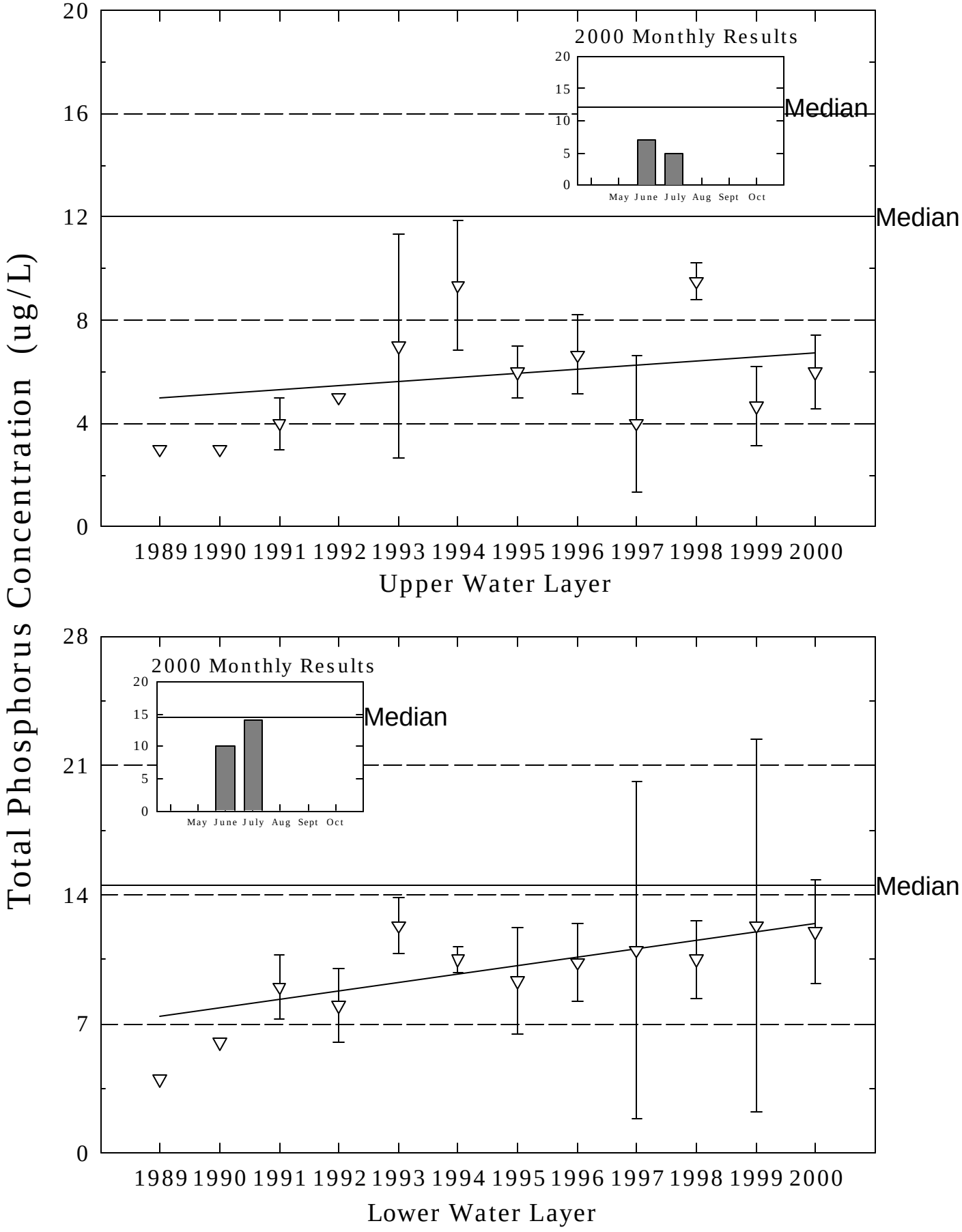


Table 1.

STONE POND

MARLBORO

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1989	1.68	1.68	1.68
1990	1.99	1.99	1.99
1991	1.09	2.80	1.96
1992	0.74	3.82	2.35
1993	1.83	6.04	3.66
1994	1.82	3.08	2.62
1995	2.58	4.01	3.42
1996	2.70	3.65	3.17
1997	2.02	6.05	3.36
1998	1.45	1.85	1.65
1999	2.56	5.62	3.89
2000	1.64	4.25	2.94

Table 2.

STONE POND

MARLBORO

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
08 / 22 / 1989	PERIDINIUM	61
	DINOBRYON	
	MELOSIRA	
09 / 05 / 1990	DINOBRYON	51
	STAURASTRUM	14
	CHRYSOSPHAERELLA	13
06 / 18 / 1991	PERIDINIUM	32
	MELOSIRA	27
	ASTERIONELLA	15
06 / 17 / 1992	CHRYSOSPHAERELLA	91
	DINOBRYON	4
07 / 07 / 1993	TABELLARIA	60
	RHIZOSOLENIA	15
	PENNATE SPP	10
07 / 21 / 1993	TABELLARIA	66
08 / 15 / 1994	TABELLARIA	86
07 / 20 / 1995	SYNURA	63
	TABELLARIA	18
	STAURASTRUM	8
07 / 15 / 1996	DINOBRYON	30
	RHIZOSOLENIA	26
	CHRYSOSPHAERELLA	21
07 / 16 / 1997	ASTERIONELLA	68
	CHRYSOSPHAERELLA	16
	SYNURA	6
08 / 20 / 1998	DINOBRYON	88
	TABELLARIA	5
	MALLOMONAS	3

Table 2.

STONE POND

MARLBORO

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/19/1999	CHRYSOSPHAERELLA	49
	STAURASTRUM	26
	TABELLARIA	14
07/21/2000	DINOBRYON	50
	CHRYSOSPHAERELLA	16
	RHIZOSOLENIA	14

Table 3.

STONE POND

MARLBORO

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1989	4.0	4.0	4.0
1990	4.5	6.3	5.4
1991	3.7	6.0	4.5
1992	4.7	7.5	6.2
1993	5.5	6.2	5.7
1994	4.0	5.7	4.7
1995	5.0	5.9	5.5
1996	5.0	7.8	5.9
1997	4.5	6.4	5.3
1998	4.5	5.6	5.0
1999	5.5	6.5	6.0
2000	5.3	5.8	5.5

Table 4.

STONE POND

MARLBORO

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
BIG ROCK STATION				
	1991	6.60	6.60	6.60
EPILIMNION				
	1989	6.55	6.55	6.55
	1990	6.57	6.57	6.57
	1991	6.63	6.70	6.66
	1992	6.36	6.60	6.46
	1993	6.39	6.66	6.54
	1994	6.43	6.81	6.57
	1995	6.55	6.71	6.65
	1996	6.33	6.44	6.38
	1997	6.50	6.65	6.57
	1998	6.14	6.46	6.27
	1999	6.24	6.83	6.39
	2000	6.22	6.25	6.23
HYPOLIMNION				
	1989	6.40	6.40	6.40
	1990	6.55	6.55	6.55
	1991	6.20	6.29	6.23
	1992	6.16	6.46	6.30
	1993	6.10	6.49	6.28
	1994	5.84	6.04	5.95
	1995	5.72	6.32	5.97
	1996	5.92	6.10	5.98
	1997	6.09	6.45	6.24

Table 4.

STONE POND

MARLBORO

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1998	6.02	6.03	6.02
	1999	5.94	6.69	6.24
	2000	5.97	6.38	6.13
INLET				
	1989	6.48	6.48	6.48
	1990	6.52	6.52	6.52
	1991	6.32	6.76	6.49
	1992	6.33	6.41	6.38
	1993	6.50	6.75	6.62
	1994	6.35	6.60	6.45
	1995	6.12	6.71	6.36
	1996	5.70	6.43	6.02
	1997	6.36	6.76	6.49
	1998	6.40	6.73	6.53
	1999	6.56	6.67	6.60
	2000	6.30	6.39	6.34
METALIMNION				
	1992	6.50	6.63	6.54
	1993	6.49	6.65	6.56
	1994	6.01	6.53	6.25
	1995	6.11	6.61	6.29
	1996	6.04	6.36	6.17
	1997	6.32	6.48	6.41
	1998	6.37	6.37	6.37
	1999	6.31	6.39	6.34
	2000	6.45	6.55	6.50

Table 4.

STONE POND

MARLBORO

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
OUTHOUSE SITE				
	1991	6.60	6.60	6.60
OUTLET				
	1989	6.59	6.59	6.59
	1990	6.58	6.58	6.58
	1991	6.60	6.70	6.65
	1992	6.33	6.55	6.45
	1993	6.45	6.45	6.45
	1994	6.28	6.28	6.28
	1995	4.16	6.46	4.46
	1996	6.23	6.46	6.34
	1997	6.46	6.49	6.47
	1998	6.27	6.41	6.33
	1999	6.12	6.53	6.27
	2000	6.38	6.45	6.41

Table 5.

STONE POND

MARLBORO

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1989	1.90	1.90	1.90
1990	2.10	2.10	2.10
1991	1.80	2.80	2.30
1992	2.00	2.10	2.07
1993	1.70	1.90	1.80
1994	1.50	2.60	1.97
1995	1.80	2.00	1.87
1996	1.50	2.10	1.87
1997	1.70	2.10	1.93
1998	1.90	2.20	2.05
1999	2.00	2.10	2.07
2000	1.70	1.90	1.80

Table 6.

STONE POND
MARLBORO

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
BIG ROCK STATION				
	1991	25.0	25.0	25.0
EPILIMNION				
	1989	26.1	26.1	26.1
	1990	24.6	24.6	24.6
	1991	24.7	25.1	24.9
	1992	24.6	25.9	25.2
	1993	24.1	24.8	24.6
	1994	25.7	26.6	26.1
	1995	25.9	26.8	26.4
	1996	25.8	27.2	26.5
	1997	23.8	24.5	24.0
	1998	21.1	24.7	22.9
	1999	26.1	26.3	26.2
	2000	25.6	25.8	25.7
HYPOLIMNION				
	1989	24.7	24.7	24.7
	1990	24.3	24.3	24.3
	1991	25.2	25.5	25.3
	1992	25.2	25.7	25.4
	1993	23.6	26.6	24.9
	1994	27.8	28.7	28.2
	1995	25.8	28.7	27.2
	1996	26.9	29.7	28.3
	1997	23.5	25.9	24.4

Table 6.

STONE POND
MARLBORO

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1998	25.4	25.7	25.5
	1999	25.7	29.6	27.0
	2000	26.0	29.0	27.5
INLET				
	1989	24.7	24.7	24.7
	1990	24.4	24.4	24.4
	1991	23.8	24.9	24.3
	1992	23.5	31.8	27.1
	1993	25.9	33.7	30.8
	1994	27.6	32.4	30.2
	1995	31.2	34.3	32.7
	1996	20.4	33.1	26.4
	1997	23.5	28.9	25.6
	1998	24.4	31.1	27.7
	1999	29.3	35.2	32.8
	2000	23.4	24.8	24.1
METALIMNION				
	1992	24.7	25.6	25.2
	1993	23.9	25.0	24.2
	1994	25.2	26.5	25.9
	1995	25.9	26.7	26.3
	1996	25.8	26.4	26.1
	1997	23.5	24.3	23.8
	1998	24.2	24.2	24.2
	1999	26.0	26.5	26.2
	2000	25.4	25.4	25.4

Table 6.

STONE POND
MARLBORO

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
OUTHOUSE SITE				
	1991	25.0	25.0	25.0
OUTLET				
	1989	25.5	25.5	25.5
	1990	24.3	24.3	24.3
	1991	24.7	24.9	24.8
	1992	25.0	25.6	25.4
	1993	24.7	24.7	24.7
	1994	25.3	25.3	25.3
	1995	26.2	60.7	43.4
	1996	25.5	27.0	26.2
	1997	23.7	24.8	24.2
	1998	24.6	25.1	24.9
	1999	26.1	27.1	26.5
	2000	25.6	25.6	25.6

Table 8.

STONE POND

MARLBORO

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
BIG ROCK STATION				
	1991	6	8	7
EPILIMNION				
	1989	3	3	3
	1990	3	3	3
	1991	3	5	4
	1992	5	5	5
	1993	3	12	6
	1994	7	12	9
	1995	5	7	6
	1996	5	8	6
	1997	1	6	4
	1998	9	10	9
	1999	3	6	4
	2000	< 5	7	6
HYPOLIMNION				
	1989	4	4	4
	1990	6	6	6
	1991	8	11	9
	1992	6	10	8
	1993	10	14	11
	1994	10	11	10
	1995	6	11	9
	1996	8	12	10
	1997	3	21	11

Table 8.

STONE POND

MARLBORO

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1998	9	12	10
	1999	6	24	12
	2000	10	14	12
INLET				
	1989	7	7	7
	1990	40	40	40
	1991	8	8	8
	1992	5	8	6
	1993	5	8	6
	1994	8	19	14
	1995	5	9	7
	1996	5	7	6
	1997	4	6	5
	1998	7	9	8
	1999	6	23	13
	2000	< 5	9	7
METALIMNION				
	1992	4	5	4
	1993	6	14	8
	1994	9	11	9
	1995	5	11	8
	1996	5	10	7
	1997	1	7	5
	1998	15	15	15
	1999	5	7	6
	2000	6	8	7

Table 8.

STONE POND

MARLBORO

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
OUTHOUSE SITE				
	1991	5	6	5
OUTLET				
	1989	2	2	2
	1990	3	3	3
	1991	5	6	5
	1992	6	18	10
	1993	7	7	7
	1994	15	15	15
	1995	8	11	9
	1996	6	8	7
	1997	5	8	6
	1998	6	12	9
	1999	5	10	7
	2000	5	8	6

Table 9.

STONE POND

MARLBORO

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		July 21, 2000	
0.1	22.2	7.5	86.0
1.0	22.0	7.5	85.5
2.0	21.9	7.5	85.4
3.0	21.8	7.5	85.3
4.0	21.7	7.4	84.6
5.0	21.6	7.5	84.8
6.0	21.4	7.6	85.7
7.0	18.1	9.6	101.7
8.0	15.4	9.1	90.7
9.0	12.9	4.9	46.7
10.0	11.5	0.2	1.6
10.5	11.2	0.3	2.5

Table 10.

STONE POND

MARLBORO

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 22, 1989	7.5	18.0	11.2	118.0
September 5, 1990	11.0	11.8	0.0	0.0
June 18, 1991	10.5	12.8	2.5	23.6
June 17, 1992	10.0	10.8	12.4	111.6
July 7, 1993	13.5	7.0	0.6	5.0
July 21, 1993	9.5	11.7	6.7	60.0
August 15, 1994	10.0	12.3	0.6	5.0
July 20, 1995	10.5	12.7	0.8	7.0
July 15, 1996	10.0	11.0	5.6	50.0
July 16, 1997	10.0	12.8	1.4	13.0
August 20, 1998	9.0	14.0	0.3	2.0
July 19, 1999	10.5	13.7	0.7	7.0
July 21, 2000	10.5	11.2	0.3	2.5

Table 11.

STONE POND
MARLBORO

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.3	0.4	0.4
	1998	0.3	0.5	0.4
	1999	0.3	0.4	0.3
	2000	0.2	0.3	0.2
HYPOLIMNION				
	1997	0.5	1.0	0.7
	1998	0.8	1.7	1.2
	1999	0.5	3.2	1.4
	2000	0.5	1.7	1.1
INLET				
	1997	0.0	0.6	0.3
	1998	0.0	0.6	0.3
	1999	0.1	0.2	0.2
	2000	0.1	0.2	0.1
METALIMNION				
	1997	0.3	0.5	0.4
	1998	0.5	0.5	0.5
	1999	0.3	0.5	0.4
	2000	0.3	0.6	0.5
OUTLET				
	1997	0.2	0.5	0.4
	1998	0.0	0.5	0.3
	1999	0.2	0.7	0.4
	2000	0.3	0.4	0.3